

AMENDMENTS TO THE SPECIFICATION

Page 1, please amend the paragraph that begins on line 7 as follows:

The wheel for vehicles, for example automobiles, is configured with a disk portion to which an axle is joined and a rim portion to which a tire is fit. The wheel is made of steel or aluminum. In recent years, the wheel for vehicles is increasingly required to have external appearance design characteristics of appearance characteristic of external appearance design in addition to mechanical characteristics such as strength, steering stability, and lightweight. This has led aluminum wheels to the mainstream because they can be produced as a single component by casting and have high degree of freedom in appearance and form.

Page 2, please amend the paragraph that begins on line 12 as follows:

When a vehicle such as an automobile is running, the wheels of the vehicle are to receive external forces such as loads and bending moments radially from outside through the disk radial portion of the wheel formed between the rim portion and the hub attachment portion where the axle is joined. Therefore, the disk radial portion, when driving, repeats elastic deformation and vibrates due to such external forces. Here, in case of a vehicle wheel configured with a steel or aluminum wheel base unit provided with a cover made of plastic such as ABS, not only the disk radial portion repeats elastic deformation and vibrates when driving as described above, but also the cover vibrates due to loads and deformation transmitted from the wheel base unit. The vibration of the wheel base unit is different in characteristics such as amplitude and intensity from the vibration of the cover due to differences in material, modulus of elasticity, and natural frequency. As a result, the vibrations of both components cause repeated colliding actions between the cover and the wheel base unit as they collide with and part from each other. Abnormal sound[[],] and noise[[],] produced by the colliding actions is a problem associated with the running wheel. Also here, if the wheel base unit and the cover are made to contact each other without a gap, the colliding actions become remarkable by the vibrations of the wheel base unit and the cover and produce large noise when traveling.

Page 3, please amend the paragraph that begins after the “Summary the Invention” on as follows:

This invention relates to a vehicle wheel having a wheel base unit made up of a disk portion and a rim portion, with a cover placed to cover the wheel base unit from its outside, characterized in that the cover has easily deformable narrow spoke portions for partially covering a disk radial portion interconnecting the hub attachment portion of the disk portion to be joined to an axle and the rim portion and that a design surface is constituted with the outside of the easily deformable narrow spoke portions and the exposed outside surface of the disk radial portion. The easily deformable narrow spoke portion of the cover is provided with a relatively thin, easily deformable part for covering the approximately middle part of the disk radial portion. Here, "exposed outside surface" of the disk radial portion refers to part of the disk radial portion that is not covered with the easily deformable narrow spoke portions and is exposed outside. Besides, the side of the vehicle wheel that faces outward of the vehicle when attached to the vehicle becomes the design surface of the wheel.

Page 4, please amend the paragraph that begins with “With the above constitution,...” on as follows:

With the above constitution, the easily deformable narrow spoke portions are made in a slender shape to have a small covering area for partially covering the disk radial portion of the wheel base unit, so that they are low in rigidity and easily deformable in comparison with the disk radial portion. Therefore, with the vehicle wheel of this invention, the easily deformable narrow spoke portions of the cover deform due to external forces that they receive when traveling such as radial loads, circumferential loads, torsional forces, and bending moments, and follow the elastic deformation of the disk radial portion that is higher in rigidity than the easily deformable narrow spoke portions. The difference in vibration characteristic between the disk radial portion and the easily deformable narrow spoke portions becomes small. The repeated colliding actions, or butting action, between the cover and the wheel base unit caused by the vibrations of both the components decrease, so that it is possible to reduce noise. It is further possible to reduce frictional actions

between the easily deformable narrow spoke portions and the disk radial portion produced with torsional vibration and radial wobble that the wheel receives when traveling and to reduce noise produced with the frictional actions. Incidentally, in case of a cover made of a material that is lower in modulus of elasticity than the wheel base unit, because the easily deformable narrow spoke portions are further even lower in rigidity than the disk radial portion, the easily deformable narrow spoke portions deform further well better to follow the elastic deformation of the disk radial portion.

Page 6, please amend the paragraph that begins with “Because the wheel base unit...” on as follows:

Because the wheel base unit of the above type of vehicle wheel has a relatively [[a]] large externally exposed area, heat radiating characteristic of the wheel can be enhanced and cooling characteristic of the brake and the like[[.]] is also enhanced. Furthermore, because the design surface is constituted by merger of the wheel base unit and the cover, it is less necessary to make the wheel base unit and the cover in complicated external shapes. Therefore, it is advantageous in the manufacture of the wheel base unit and the cover because the constitution of dies is simplified and related costs are reduced, and manufacturing process can be made further more efficient.

Page 7, please amend the paragraph that begins with “As for the above vehicle wheel ...” on as follows:

As for the above vehicle wheel, a constitution is proposed in which the easily deformable narrow spoke portions of the cover have an inside surface shape that comes in tight, even contact with the covered surface on the outer side of the disk radial portion covered with the easily deformable narrow spoke portions. Because the border between the easily deformable narrow spoke portions and the disk radial portion is visibly recognizable, a gap if present at the border may detract from design beauty. Therefore, causing tight contact between the covered surface of the disk radial portion and the easily deformable narrow spoke portions almost without a gap makes it possible to improve the appearance of the border and the design characteristic of the wheel. Incidentally, it is possible to bring the easily deformable narrow spoke portions and the disk radial portion into

appropriately tight contact with each other, for example, with a constitution in which the cover is secured to the wheel base unit in two portions, one near the wheel center and the other near the rim flange.

Page 8, please amend the paragraph that begins with “The vehicle wheel with …” on as follows:

The vehicle wheel with the cover in tight contact with the wheel base unit as described above, if constituted in the conventional manner, has a big problem of interference due to the colliding actions, caused by external forces produced when traveling, between the wheel base unit and the cover. According to the invention, however, the cover having the easily deformable narrow spoke portions that are flexible and easily deformable is attached to the vehicle wheel. This makes it possible to reduce the colliding actions between the easily deformable narrow spoke portions and the disk radial portion even with the constitution in which the easily deformable narrow spoke portions and the disk radial portion are in tight contact with each other because the easily deformable narrow spoke portions follow the disk radial portion elastically deformed by forces it receives when driving as described above. Accordingly, it is possible to reduce noise produced when driving and provide low noise characteristic.

Page 8, please amend the paragraph that begins with “Here, it is possible to make …” on as follows:

Here, it is possible to make the inside surface shape of the easily deformable narrow spoke portions covering the disk radial portion to be even with the outside surface of the disk radial portion. In this case, whole or a specified area of the inside surface is made to be in tight contact, without a gap, with the covered surface of the disk radial portion. Such easily deformable narrow spoke portions are preferably made, for example, to be solid or hollow in cross section.

Page 8, please amend the paragraph that begins with “It is also proposed here …” on as follows:

It is also proposed here a constitution of the easily deformable narrow spoke portions having side edges in evenly tight contact with the covered surface of the disk radial portion. In such a constitution, the side edges even with the outside surface are formed in the portion bordering the disk radial portion, so that it is possible, similarly to the above, to improve appearance of the exposed portion of the wheel base unit and design characteristic of the vehicle wheel. Such easily deformable narrow spoke portions maybe made, for example, with a cross section of U-shape that is open at the side edges. With this constitution, the opening edges, namely both side edges, that cover and in contact with the outside surface of the disk radial portion come in evenly tight contact with the outside surface. In case only one of the opening edges is made to contact the outside surface depending on the shape of the cover, that one is the side edge.

Page 13, please amend the paragraph that begins with “In this embodiment as described ...” on as follows:

In this embodiment as described above, the easily deformable narrow spoke portions 20, 20 covering the disk radial portion 7 are formed with the easily deformable parts 20a, 20a to cover the most raised portion located in about the middle of the disk radial portion 7. That is, because the most raised portion located in about the middle of the disk radial portion 7 and raised outward in the wheel axis direction deforms the most by vibration received when driving, the easily deformable parts 20a are used to cover about the middle portion. The easily deformable parts 20a, 20a are formed along about the radially middle portion of the easily deformable narrow spoke portions 20, 20, in U-shape in cross section as shown in FIG. 4. The easily deformable parts 20a, 20a are made, because they cover the most raised portion of the disk radial portion 7, ~~are made~~ in low profile with low-height side walls of the U-shape cross section (see FIGS. 3 and 7). As a result, the easily deformable parts 20a are the lowest in rigidity and the most deformable in the easily deformable narrow spoke portions 20.

Page 15, please amend the paragraph that begins with “As described above, it is possible ...” on as follows:

As described above, it is possible to make the cover 3 less likely to come off the wheel base unit 2 by securing it to the wheel base unit 2 in both the radially central and peripheral areas of the wheel. Because the side edges 26, 26 of the easily deformable narrow spoke portions 20, 20 come into tight contact with the covered surface 25 of the disk radial portion 7, visual impression of the border between the easily deformable narrow spoke portions 20, 20 and the disk radial portion 7 seen on the exposed portion 28 of the wheel base unit 2 is improved to further enhance the design beauty. This cover 3 provides still another excellent advantage in that [[is]] tight contact without a gap between the easily deformable narrow spoke portions 20, 20 and the disk radial portion 7 prevents water such as rain water from finding its way into the interior of the easily deformable narrow spoke portions 20, 20 of the U-shape cross section and appropriately prevents deterioration due to corrosion.

Page 15, please amend the paragraph that begins with “Design surface of such a vehicle ...” on as follows:

Design surface of such a vehicle wheel 1 made up of the wheel base unit 2 with the cover 3 attached thereto is constituted with the cover 3 and the exposed portion 28, not covered with the cover 3, of the wheel base unit 2. Such a design surface produces a three-dimensional form with excellent solid appearance because a depth is produced with the easily deformable narrow spoke portions 20, 20 of the cover 3 and the exposed portion 28 of the disk radial portion 7 visible between the easily deformable narrow spoke portions 20, 20. Solid appearance of the vehicle wheel 1 is further emphasized as the easily deformable narrow spoke portions 20, 20 of the cover 3 are shaped to slope outward in the wheel axis direction from the hub hole covering portion 22 toward the periphery covering portion 23 (see FIG. 3). In this way, this vehicle wheel 1 provides excellent design characteristic with the design surface made in a complicated, three-dimensional shape not found in conventional constitution. Incidentally, the exposed portion 28 appearing between the pair of easily deformable narrow spoke portions 20, 20 includes the bolt holes 8.

Page 16, please amend the paragraph that begins with “Design surface of such a vehicle ...” on as follows:

Here, a vehicle wheel of conventional constitution (not shown) was prepared as a comparative example in which the entire surface of the wheel base unit 2 is covered with a plastic cover. During the above tests, sound volumes produced with the comparative sample wheel and the vehicle wheel 1 of this embodiment were measured. As a result, the vehicle wheel 1 of this embodiment proved to produce less volume of sound to provide low noise characteristic in comparison with the example wheel. This is understood as follows:[.] The easily deformable parts 20a, 20a of low rigidity formed in the middle parts of the easily deformable narrow spoke portions 20, 20 come in tight contact with the middle, most deformable part of the disk radial portion 7 raised outward in the wheel axis direction. Therefore, the easily deformable parts 20a, 20a of the easily deformable narrow spoke portions 20, 20 deform easily to follow the elastic deformation that occurs in the middle part of the disk radial portion 7. As a whole, colliding actions, repeated collisions, between the disk radial portion 7 and the easily deformable narrow spoke portions 20, 20, are reduced. In this way, this embodiment reduces the colliding actions to efficiently provide low noise characteristic.

Page 18, please amend the paragraph that begins with “Because the design surface …” on as follows:

Because the design surface of the above vehicle wheel 1 is constituted by the merger of the cover 3 and the wheel base unit 2, each component need not be of much complicated shape. Therefore, it is possible to simplify manufacturing process ~~of~~by both the cover 3 and the wheel base unit 2. This is another excellent advantage of further improving production efficiency of the vehicle wheel 1.

Page 18, please amend the paragraph that begins with “As described above, this embodiment …” on as follows:

As described above, this embodiment is constituted in that the easily deformable narrow spoke portion 20 is provided with the easily deformable part 20a to cover the most raised portion located in about the middle of the disk radial portion 7 so that the easily deformable narrow spoke

portion 20 as a whole can fulfill its function. Here, the thin shape of the easily deformable part 20a may be realized by, besides lowering the side walls of the U-shape cross section as described above, reducing the wall thickness of each wall constituting the U-shape cross section, or widening the distance between the side walls of the U-shape cross section.

Page 19, please amend the paragraph that begins with “The cover 3 according to the ...” on as follows:

The cover 3 according to the above embodiment is constituted in that the peripheral attachment lug 30 and the hole attachment lug 32 are respectively made to engage with the inside circumferential recess of the hump portion 19 and the opening edge 40 of the hub hole 6 of the wheel base unit 2. Another cover 3' of a different constitution may also be made as shown in FIG. 8 in which a hole seat surface 36 is formed on the radially outer side of the hub hole covering portion 22 between a pair of the easily deformable narrow spoke portions 20, 20, with the hole seat surface 36 bored with a cover holding hole 35 communicated with the bolt hole 8 of the wheel base unit 2. The cover 3' is formed like the above embodiment with the peripheral attachment lug 30 (not shown in FIG. 8). To attach the cover 3', the cover holding hole 35 is aligned with the bolt hole 8 as shown in FIG. 9 and the peripheral attachment lug 30 is made to engage with the inside circumferential recess of the hump portion 19. When the vehicle wheel 1' with the cover 3' is installed to an automobile, a bolt (not shown) projecting from the hub of the automobile projects from the inside of the wheel 1' to the outside of the cover holding hole 35. Then the bolt is tightened to the hole seat surface 36 using a specified nut 38. In this way, the vehicle wheel 1' is secured to the axle, the cover 3' is secured to the wheel base unit 2, and the side edge 26 of the easily deformable narrow spoke portion 20 comes into tight contact with the covered surface 25 of the disk radial portion 7. Also the above constitution, like the above embodiment, can display excellent design characteristic and low noise characteristic.

Page 20, please amend the paragraph that begins with “The above embodiment …” on as follows:

The above embodiment is constituted with the wheel base unit 2 to which is attached the cover 3 having the pair of easily deformable narrow spoke portions 20, 20 for covering both side areas of the disk radial portion 7. Another vehicle wheel 51 of a different constitution may also be made as shown in FIG. 10 in which a cover 53 having easily deformable narrow spoke portions 50 is attached to a wheel base unit 52, with the easily deformable narrow spoke portion 50 covering the central area (covered surface) extending in the radial direction of the disk radial portion 57 of the wheel base unit 52. The easily deformable narrow spoke portion 50 here, like the above embodiment, is formed with an easily deformable part 56-50a in about the middle of the disk radial portion 57. Also such vehicle wheel 51, like that of the above embodiment, shows superior design characteristic and low noise characteristic.